

DEER CREEK AND TULE RIVER AUTHORITY
GROUNDWATER ASSESSMENT ANALYSIS AND REPORT

ATTACHMENT 5: WORK PLAN

The Deer Creek and Tule River Authority (Authority) is proposing to prepare a Groundwater Assessment Analysis and Report (Project) to better understand the DCTRA Basin and meet some of the Basin Management Objectives of the Groundwater Management Plan (GWMP).

Following is a detailed Scope of Work to complete the Project, summary of how the proposed Project will implement the objectives of the existing GWMP, the Project Performance and Deliverables, and the Environmental Compliance for Project.

Scope of Work:

The Project is broken down into five (5) separate tasks, each with a purpose, budget, and schedule. Having multiple tasks allows for better accountability and helps avoid setbacks in the schedule. The Project Director, Dan Vink, a member of the Authority, will oversee the Project. A Consultant, 4Creeks, Inc., will be used to complete the individual tasks. Following is a detailed summary of each Task proposed to complete the Project.

TASK 1: Collect Available Historical Data within DCTRA Basin

To complete Task 1, the following specific items will be completed:

- Identify the potential available sources of existing groundwater data within the DCTRA Basin, including groundwater quality data and depth to groundwater data. The focus of the groundwater quality data will be to locate data regarding Nitrate (or Nitrate as Nitrogen) and Electrical Conductivity (a measure of salt content). If additional water quality data is available, it will be noted and filed, the analysis is to focus on these two constituents of concern. Different stakeholders, commodity groups, industry groups, communities, and municipalities have been collecting and submitting groundwater data to different government agencies due to regulatory requirements, in some cases for more than 50 years. One example is that there are approximately 130 operating dairy facilities within the DCTRA Basin. As of 2007, each of these facilities were required to submit groundwater quality data, and in some case depth to groundwater data, on an Annual Basis to the Regional Water Quality Control Board. This data has not been organized or summarized, but is readily available and would provide a much better understanding of Basin conditions. Most data can be made available by stakeholders or agencies through the Freedom of Information Act. The locations of where the data may be found at, but not limited to, are at the following agencies:
 - Department of Pesticide Regulation (DPR)
 - United States Geological Survey (USGS) State Water Board Groundwater Ambient Monitoring and Assessment (GAMA)
 - California Department of Public Health (CDPH)
 - California Regional Water Quality Control Board (RWQCB), including Dairy data, other waste discharge permitted data, Irrigated Lands Waiver Program surface water data.
 - Public Service Districts (Pixley, Tipton, etc.)
 - Municipality Data (Porterville)
 - Tulare County Environmental Health Services Data

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- Identify the potential available sources of existing land use, cropping patterns, and surface water data. To better understand the water demands within the Basin, it is necessary to understand the crops grown, the existing land use and changes in land use over time and the available surface water data utilized within the Basin. The locations of where the data may be found at, but not limited to, are the following agencies:
 - Bureau of Reclamation
 - Friant-Kern Canal, Central Valley Project Data
 - Army Corps of Engineer Data for Success Dam
 - Tule River Association
- Meet with the agencies to gather the existing data, including scanning data and copying data into project files.
- Project Management for the task including lining out technical staff on specific areas to focus, manage schedule, prepare monthly progress report updates, and prepare monthly invoices. On a quarterly basis, prepare a Progress Report to be submitted to the DWR staff.

TASK 2: Compile Data Collected, Analyze Data, and Generate Trend Graphs and Maps

To complete Task 2, the following specific items will be completed:

- Create a standard data management system for data to be inputted and evaluated on a consistent level. This will include an Access or Excel database which can easily be imported into ArcGIS or other mapping software system. The data system will standardize the datum used for elevation, the coordinate system used to identify location, and provide standard naming conventions for different wells (State Well Numbers, etc.).
- Input all gathered data into the data management system. The technical staff assigned to the project will take the data collected from the different agencies and compile the data into the standard database for each well and for each year of data.
- Create a standard GIS Mapping system, including borders, background data (Parcels, district boundaries, city boundaries, USGS Quad Map, surface water features, etc.)
- Analyze data within the standard database once all the historical data has been inputted. On a year by year basis, as well as an overall basis, trends and graphs will be created for groundwater quality and groundwater depth. The data will be organize per DCTRA member boundary, allowing for trends and graphs to be created specifically for a member as well as overall. This will allow each member to see how they compare to the overall basin trends and conditions.
- Generate Isopleth Maps based on groundwater quality data for both Nitrate and Electrical Conductivity. These maps may be created on an Annual basis dependent upon the number of years data is available. If there are more than 10 years of data, the Isopleth maps will be generated on a bi-annual basis up to a 5 year basis.
- Generate Groundwater Flow Maps based on groundwater depth data. These maps will be created on a 5 year basis, as this data may go back for more than 50 years in portions of the Basin.
- Project Management for the task including lining out technical staff on specific areas to focus, manage schedule, prepare monthly progress report updates, and prepare monthly invoices. On a quarterly basis, prepare a Progress Report to be submitted to the DWR staff.

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TASK 3: Establish a Surveyed Control Network to measure Land Subsidence

To better understand the effects of groundwater overdrafting within the Basin, a land subsidence monitoring network will be established. Once established, the network can be spot checked in the future years to determine changes in elevation due to subsidence. To complete Task 3, the following specific items will be completed:

- Prepare the Survey Equipment for the overall establishment of the Land Subsidence Network. The DCTRA Basin area covers approximately 660 square miles. Because of the expansive nature of the basin area, and its sheer size, conventional surveying methods would make it both very difficult and expensive to monitor something such as land subsidence. Our solution to these potential road blocks is utilizing real time kinematic (RTK) GPS survey equipment and software.

Real time kinematic GPS is a position location process whereby signals received from a reference device (such as a GPS receiver) can be compared using carrier phase corrections transmitted from a reference station to the user's roving receiver. Using the correction information, RTK systems can provide real time accuracy below 2 cm.

The Federal Government has a number of programs in place, that provide the general public with real time positions (both horizontal and vertical) of various maintained stations throughout the state. The main agency in charge of maintaining these stations, which are referred to as CORS (Continually Operating Reference Station), is the National Geodetic Survey (NGS). One of these stations is operated by California Surveying and Drafting, Inc. (CSDS) in Sacramento, Ca.

CSDS in conjunction with Trimble Navigation, has set up a virtual reference network (California Surveying Virtual Survey Network) that allows the end user to access this positional data, utilizing a cell phone connection, and their GPS field units. The surveyor intends to utilize this service by occupying and observing a number of the wells which span the DCTRA basin, in order to create a base line of elevations, to utilize in monitoring the subsidence across the region. The solutions/positions provided using this service will enable the surveyor to establish high accuracy Latitudes and Longitudes (North American Datum of 1983) along with elevations above sea level based on the North American Vertical Datum of 1988 (NAVD88). The network established will be utilizing the most recent models of the earth's surface called Geoid09 which is a model provided by NGS.

Establishing this baseline, by using GPS and a CORS network, the surveyor will be able to revisit various wells, in future years, and monitor their changes in position and elevation. We believe that it is paramount that the control (CORS) for this network be outside the area, so that it is not impacted by the large amounts of land subsidence previously observed across the valley, or if local CORS are used, that they are monitored. This approach will give us a global perspective as to what is going on with the land locally, by utilizing control from CORS, across the area.

With this data, the surveyor will be able to provide high accuracy mapping and GIS data, which can be used in water studies, future planning, and many other applications. By standardizing the information and exhibits, our hope will be to paint a picture of land subsidence over the years across the DCTRA basin.

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In an effort to maximize field time, and minimize project setups, the surveyor will utilize a GPS enabled Virtual Reference network, maintained by California Surveying and Drafting, Inc. CSDS is headquartered in Sacramento, Ca. CSDS has been in operation for over 25 years, and has become one of California's largest surveying equipment and hardware providers. CSDS has worked with Trimble Navigation, one of the world's largest GPS equipment/software providers, to create Northern California's first wide-area, high-accuracy, real-time GNSS reference station network: The California Surveying Virtual Survey Network (CSVSN).

The advent of Trimble Virtual Reference Station (VRS) technology has provided surveying, mapping and construction professionals with the ability to access precise GNSS data over the Internet. When this technology is used in a true RTK network, it results in centimeter accuracy, shorter initialization times, greater reliability and assured data availability. Some of the advantages of using the CSVSN network are:

- The largest coverage area (Redding to Bakersfield)
 - The ability to survey with only a rover
 - True network RTK solution
 - Centimeter accuracy
 - Shorter initialization times
 - Superior baseline performance
 - Long-term data retention available for download
- Identify the land subsidence network to be included in the evaluation, including baseline controls benchmarks.
- Complete the field work to establish the existing elevations. The network will utilize accessible control points through county benchmarks on highways and road. In addition, existing irrigation structures, Success Dam, and existing wells within the DCTRA monitoring network will be used to avoid having access issues on private land.
- Download Field Data and generate data summary
- Export field data to GIS database and generate a GIS Control Network Exhibit
- Project Management for the task including lining out both field and technical staff on specific areas to focus, manage schedule, prepare monthly progress report updates, and prepare monthly invoices. On a quarterly basis, prepare a Progress Report to be submitted to the DWR staff.

TASK 4: Create Summary Report of Basin Conditions to Stakeholders

To complete Task 4, the following specific items will be completed:

- Create a Groundwater Assessment Report which includes a summary of the historical groundwater data collected, summary of the maps and trends, overview of the land subsidence network, and conclusions with recommendations to the DCTRA Board based on GWMP BMO. At a minimum, the Report will include information on the existing groundwater data collection methods and analysis efforts, detailed land use and crop information, copies of the groundwater flow maps and isopleths maps generated, and any additional background basin information collected (soil survey data, recharge information, etc.)

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- Identify a list of priority projects and monitoring for the DCTRA Board to consider based upon the data and analysis completed.
- Project Management for the task including lining technical staff on specific areas to focus, manage schedule, prepare monthly progress report updates, and prepare monthly invoices. On a quarterly basis, prepare a Progress Report to be submitted to the DWR staff.

TASK 5: Prepare Outreach Materials to Basin Stakeholders

To complete Task 5, the following specific items will be completed:

- Prepare a summary Power Point Presentation for the DCTRA Board and members of the Public interested in the historical basin analysis.
- Create a DCTRA website, highlighting the historical trends identified within the Basin.
- Create a summary brochure of the DCTRA basin outlining the historical trends
- Project Management for the task including lining out technical staff on specific areas to focus, manage schedule, prepare monthly progress report updates, and prepare monthly invoices. On a quarterly basis, prepare a Progress Report to be submitted to the DWR staff.

Project Implementation of Existing GWMP:

The DCTRA Board adopted the latest GWMP Update in May 2012 which includes five (5) Basin Management Objectives (BMO) as follows:

- Groundwater Resource Protection
- Groundwater Sustainability
- Groundwater Resource Understanding
- Groundwater Basin Understanding
- Information Dissemination

Each of these BMO's has a specific purpose and goal to help manage the groundwater within the DCTRA Basin. But, because there has not been a collective collaboration between all the stakeholders, member participants, and communities within the Basin, it is difficult to achieve some of the BMO's. For instance, it is difficult to achieve specific Groundwater Resource Protection Objectives when there is limited information on groundwater quality available on a Basin wide scale. Overall management practices can be implemented, but source identification is not possible without more information and data. Another example is that it is difficult to achieve Groundwater Sustainability without understanding the areas within the Basin that may be overdrafting groundwater.

In summary, the purpose of this proposed Project is to gather existing data, establish data management systems and mapping systems, analyze and provide trends of the historical conditions, and provide a website and other outreach items to help inform the DCTRA Board and Stakeholder the condition of the Basin. This project focuses on the Groundwater Basin Understanding and Information Dissemination BMO's.

Project Performance and Deliverables:

Following is a list of the Project performance and deliverables for assessing progress and accomplishments during the duration of the Project and the final Project reports.

Ongoing Progress Reports:

During the duration of the Project, ongoing project update and progress reports will be completed, outlining both the financial progress and workload progress. The purpose of the ongoing progress reports are to ensure the project stays on schedule and within budget. Following is an outline of how the project will be held accountable through the DCTRA Advisory Committee and Board. On a monthly basis, the Project Manager (consultant) will provide the Project Director a memorandum summarizing the project workload status as compared to the schedule and provide an invoice summarizing the expenses and labor from the previous month. The Project Director will provide an update to the Advisory Committee monthly on the status of the Project. Every two months, the DCTRA Board meets and the Advisory Committee will provide the DCTRA Board with updates on the progress of the project as identified in the monthly progress reports to the Project Director. Having constant communication and updates between the DCTRA staff, the consultant, and the DCTRA Board will keep each member accountable and help keep the project on schedule.

On a quarterly basis, a progress report will be provided to the Department of Water Resources (DWR) staff assigned to this Project Grant. The Quarterly Progress Report will include an update on the financial aspects to the Project, as well as an update on the workload as compared to the schedule. DWR Staff can request an updated Progress Report at any time during the duration of the Project, at a minimum the Staff will receive a quarterly report.

Final Project Reports:

At the time the Project is completed, the following Project deliverables will be completed:

- Groundwater Assessment Report, which includes:
 - Narrative analysis of historical data
 - Trend Graphs of historical groundwater quality and depth data
 - Historical Isopleth Maps of groundwater quality data
 - Groundwater Flow maps (5 year increments)
 - Conclusions and Recommendations
- DCTRA Website with summary data
- Power Point Presentation Summarizing Analysis and the Report
- Brochure with summary data

Environmental Compliance:

The proposed Project will not require any environmental compliance permitting or other permits to complete the Project.